

## Introduction

Weaning from mechanical ventilation is a critical ICU decision. Early weaning prevents complications, but premature extubation increases failure risk. The process starts with screening for readiness to wean and a spontaneous breathing trial (SBT), ensuring adequate oxygenation, ventilation, and airway reflexes. Despite meeting weaning criteria, nearly one third of patients fail due to the heterogeneity of critically ill patients. Since 2009, cardiac factors like pulmonary edema and hypervolemia have been recognized as contributors to weaning failure. Thoracic fluid content (TFC), measured via impedance cardiography, reflects total thoracic levels. While many weaning indices exist, none are ideal. Before 1991, clinicians relied on predictors like vital capacity and minute ventilation. Yang and Tobin introduced the Rapid shallow breathing index (RSBI), defined as respiratory rate (RR) to tidal volume (VT) ratio. RSBI >105 breaths/min/L predicts failure, while RSBI <105 suggests success.

## Aim of the Work

The aim of our work was to make a comparison between electrical cardiometry (TFC as a parameter) and rapid shallow breathing index in prediction of the weaning from mechanical ventilation in critically ill patients.

## Patients and Methods

This observational prospective cohort study included 60 critically ill patients on mechanical ventilation at Alexandria University Hospital. Inclusion criteria were adults ≥18yrs, mechanically ventilated for ≥ 24hrs, eligible for weaning, with an intact cough reflex, hemodynamically stable (MAP ≥65, SBP 90-180), and adequate oxygenation (PaO2/FiO2 ≥150 mmHg or SpO2 ≥90% on FiO2≤ 40% and PEEP ≤5 cmH2O). Exclusion criteria included cardiac arrest, pregnancy, end-stage renal or liver disease, pneumothorax, refractory shock, extensive chest wall edema, and morbid obesity.

RSBI was calculated on PSV 5 cmH2O above PEEP, then SBT was performed on PS 8 cmH2O and PEEP 5 cmH2O for 30-60 min. Extubation was deemed successful if no reintubation occurred within 48hrs. Thoracic fluid content was measured using electrical cardiometry before SBT. Extubation decisions were made by the attending physicians.

## Results

Table 1: Comparing the two groups in regard to RSBI and TFC

	Total (n = 60)	Success Weaning (n = 30)	Fail Weaning (n = 30)	U	p
<b>RSBI</b>				63.000*	<0.001*
Min. – Max.	23.0–160.0	23.0–69.0	28.0–160.0		
Mean ± SD.	85.13±48.69	46.97±14.46	123.3±40.01		
Median (IQR)	69.0 (44.25–140.0)	47.50 (38.0–56.0)	140.0 (116.0–150.0)		
<b>TFC</b>				194.500*	<0.001*
Min. – Max.	22.0–90.0	24.0–90.0	22.0–67.0		
Mean ± SD.	41.25±12.55	36.07±12.21	46.43±10.76		
Median (IQR)	37.50(32.0–52.0)	33.50(29.0–38.0)	50.0 (37.0–53.0)		

Data are presented as mean ± SD, Median (IQR). SD: standard deviation, IQR: interquartile range, RSBI: Rapid Shallow Breathing Index, TFC: thoracic fluid content, SD: Standard deviation, U: Mann Whitney test, p: p value for comparing between the two studied groups, \*: Statistically significant at  $p \leq 0.05$

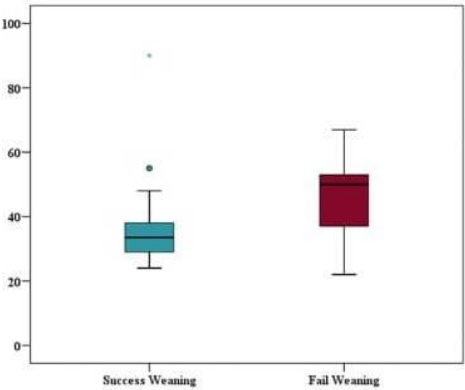


Figure 1: Comparing the two groups in regard toRSBI

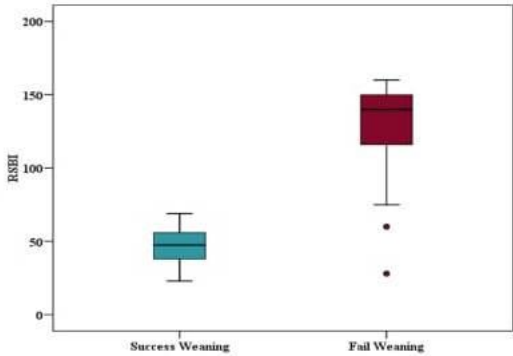


Figure2: Comparing the two groups in regard toTFC

	AUC	p	95% C.I	Cut off#	Sensitivity	Specificity	PPV	NPV
<b>RSBI</b>	0.930	<0.001*	0.852	≤69	100.00	86.67	88.2	100.0
			– 1.000	≤105	100.0	76.7	81.1	100.0
<b>TFC</b>	0.784	<0.001*	0.662	≤39	86.67	73.33	76.5	84.6
			– 0.906	≤50	93.3	50.0	65.1	88.2

AUC: Area UnderaCurve, p value:Probabilityvalue, CI:ConfidenceIntervals, NPV: Negativepredictivevalue, PPV: Positive predictivevalue, RSBI: Rapid Shallow Breathing Index, TFC: thoracic fluid content, \*: Statistically significant as  $p \leq 0.05$ , #Cut off was choose according to Youden index

## Conclusion

- RSBI is a widely accepted and more established tool for predicting weaning outcomes with better overall accuracy than TFC.
- TFC offers a superior evaluation of fluid status, particularly in patients with fluid overload or cardiac dysfunction.